

CE 602- HGE [Engr. Calaque, Dario Jr. A]

1st QUIZ

INSTRUCTIONS:

- CHEATING IS PROHIBITED! Mind your own paper. Any act of cheating (using of cellular phones, books, and lecture materials during examination, copying answers from your seatmate, etc.) will result to failure of examination.
- No borrowing of calculator.

01. Given below are the tabulated results in the field compaction test.

Unit Weight Determination

Test No	1	2	3	4	5
Wt. of mold + Compacted Soil	5.9kgs	6.2kgs	6.3kgs	6.1kgs	6.0kgs
Wt. of Mold	4.2kgs	4.2kg	4.2kg	4.2kg	4.2kg
Volume of Mold	0.00094m ³	0.00094m ³	0.00094m ³	0.00094m ³	0.00094m ³

Water Content Determination

Test No	1	2	3	4	5
Wt. of container + Wet Soil	42.4g	42.1g	40.3g	52.7g	56.2g
Wt. of container + Dry Soil	40.9g	39.9g	37.1g	47.0g	48.8g
Wt. of Container	14.5g	14.6g	13.7g	12.9g	14.0g

Compute the degree of saturation at the optimum moisture content if the specific gravity of soil is 2.70

- 56.92%
- 76.92%
- 86.92%**
- 96.92%

02. A sample of clayey silt is mixed at about its liquid limit of 40. It is placed carefully in a small porcelain dish with a volume of 19.3cc and weighs 34.67g. After oven drying, the soil pat displaced 216.8g of mercury. Determine the shrinkage limit of the soil sample.

- 16.43%
- 26.43%**
- 36.43%
- 46.43%

03. In a construction of a portion of a highway embankment, it uses a granular soil as a sub-base. The required compacted thickness of the sub-base is 300mm and the material is to be compacted at a water content of 12% to a dry unit weight of 17.3 kN/m^3 . The borrow material is found to weigh 100kN per truck load when it was dumped loosely into a truck having a capacity of 6 cubic meters. The water content of the borrow material was determined from a sample taken from the truck and found to be 10%. If the width and length of the portion of a highway is 30m and 3600m, respectively. Determine how many truckloads are required to construct the sub-base?

a) 6166trucks

b) 5166trucks

c) 3166trucks

d) 2166trucks

04. From the result of the liquid limit and plastic limit test as given in the tabulated results:

Plastic Limit Test

Test No	Wt. of container + Wet Soil	Wt. of Container + Dry Soil	Wt. of Container
1	22.12g	20.42g	13.07g
2	21.84g	20.19g	13.18g

Liquid Limit Test

Test No	No. of Blows	Wt. of container + Wet Soil	Wt. of Container + Dry Soil	Wt. of Container
1	29	22.24g	19.44g	12.74g
2	21	21.19g	18.78g	13.24g
3	17	21.27g	18.75g	13.06g
4	13	26.12g	22.10g	13.29g

Determine the toughness index

a) 1.29

b) 1.78

c) 1.56

d) 1.31

05. A saturated sample of clay with a shrinkage limit of 22 has a natural water content of 35%. What would its dry volume be as a percentage of its original volume if $\rho_s = 2.70$?

a) 51.9%

b) 61.9%

c) 71.9%

d) 81.9%

06. A clay soil is found to have a liquid limit of 75%, a plastic limit of 45% and a shrinkage limit of 25%. If a sample of this soil has a total volume of 30cc at the liquid limit and a volume of 16.7 cc at the shrinkage limit, determine the specific gravity of solids.

- a) 1.67
- b) 2.24
- c) 2.67**
- d) 1.69

07. From the result of the liquid limit and plastic limit test as given in the tabulated results:

Plastic Limit Test

Test No	Wt. of container + Wet Soil	Wt. of Container + Dry Soil	Wt. of Container
1	22.12g	20.42g	13.07g
2	21.84g	20.19g	13.18g

Liquid Limit Test

Test No	No. of Blows	Wt. of container + Wet Soil	Wt. of Container + Dry Soil	Wt. of Container
1	29	22.24g	19.44g	12.74g
2	21	21.19g	18.78g	13.24g
3	17	21.27g	18.75g	13.06g
4	13	26.12g	22.10g	13.29g

Determine the plasticity index

- a) 14.26
- b) 16.26
- c) 18.26
- d) 19.26**

08. The moist unit weight and degree of saturation of a soil are given in the following table.

Degree of Saturation	Moist Unit Weight (KN/m ³)
50%	16.64
75%	17.73

Determine the void ratio.

- a) 0.50
- b) 0.60
- c) 0.70
- d) 0.80**

09. A dry soil is mixed with 17% by mass with water and compacted. Volume of wet soil is 0.001m^3 and has a mass of 1.6kgs. If the specific gravity of soil is 2.70. Compute the degree of saturation.

- a) 17.3%
- b) 27.3%
- c) 37.3%
- d) 47.3%**

10. The following data shows the results of the liquid limit and plastic limit test

Liquid Limit:

Test Number	1	2	3	4
No. of Blows	39	23	20	13
Weight of Wet Soil + Container	22.24g	21.19g	21.27g	26.12g
Weight of Dry Soil + Container	19.44g	18.78g	18.75g	22.10g
Weight of Container	12.74g	13.24g	13.06g	13.27g

Plastic Limit

Test Number	1	2
Weight of Wet Soil + Container	22.12g	21.84g
Weight of Dry Soil + Container	20.42g	20.19g
Weight of Container	13.07g	13.18g

Natural Water Content

Test Number	1	2
Weight of Wet Soil + Container	17.53g	16.97g
Weight of Dry Soil + Container	14.84g	14.36g
Weight of Container	13.07g	7.5g

Calculate the plasticity index.

- a) 19.66**
- b) 18.66
- c) 17.66
- d) 16.66

11. A soil sample has a dry unit weight of 17.79KN/m^3 and a void ratio of 0.50. Determine the effective unit weight.

- a) 17.25KN/m^3
- b) 15.25KN/m^3
- c) 11.25KN/m^3**
- d) 13.25KN/m^3

12. The results of a Standard Proctor Tests are given in the following table

Test No.	Volume of Proctor Mold (cc)	Moist weight of Wet Soil in the mold (kg)	Moisture Content (%)
1	943.3	1.68	9.9
2	943.3	1.71	10.6
3	943.3	1.77	12.1
4	943.3	1.83	13.8
5	943.3	1.86	15.1
6	943.3	1.88	17.4
7	943.3	1.87	19.4
8	943.3	1.85	21.2

Determine the maximum dry unit weight of compaction

- a) 14.85 KN/m³
- b) 15.85 KN/m³
- c) 16.85 KN/m³**
- d) 17.85 KN/m³

13. A silty clay has a plastic limit of 25 and a plasticity index of 30. If the clay has a liquidity index of 0.20, compute the moist unit weight of the clay if the void ratio is 0.90, $G_s = 2.70$

- a) 18.07KN/m³**
- b) 18.17KN/m³
- c) 18.27KN/m³
- d) 18.37KN/m³

14. The total weight of soil when saturated 1526g and the weight of the soil after drying is 1053g. If the specific gravity of soil is 2.84, compute the porosity.

- a) 0.56**
- b) 0.32
- c) 0.78
- d) 0.93

15. A clay has the following Atterberg limits: Liquid limit = 60%, Plastic Limit = 40%, Shrinkage Limit = 25%. The clay shrinks from 15cc to 9.57cc when the moisture content is decreased from the liquid limit to the shrinkage limit. What is the specific gravity of the soil?

- a) 2.24
- b) 2.67
- c) 2.72**
- d) 2.88

16. A clay has the following Atterberg limits: Liquid limit = 60%, Plastic Limit = 40%, Shrinkage Limit = 25%. The clay shrinks from 15cc to 9.57cc when the moisture content is decreased from the liquid limit to the shrinkage limit. From a hydrometer analysis to determine particle sizes, it is found that 45 percent of the sample consists of particles smaller than 0.002mm. From this information indicate the activity classification of the clay.

a) 0.44

b) 0.11

c) 0.66

d) 0.22

17. In a liquid limit, using a cone penetrometer, the following readings were recorded and tabulated as shown.

Plastic Limit Test

Trial	Wet Unit Weight (KN/m ³)	Dry Unit Weight (KN/m ³)
1	128.6	105.4
2	141.4	116.8
3	132.6	109.6
4	134.5	111.2
5	136.0	113.4

Liquid Limit Test

Moisture Content (%)	Cone Penetration (mm)
42.5	16.0
47.5	17.5
58.1	22.8
60.0	26.0

If the natural water content of the soil is 38%, determine the liquidity index.

a) 0.11

b) 0.33

c) 0.55

d) 0.77

18. A soil having a specific gravity of 2.74 has a moist unit weight of 20.6 KN/m³ and a moisture content of 16.6%. Compute the weight of water in KN to be added per cubic meter of soil for 100% degree of saturation.

a) 0.22KN/m³

b) 0.33KN/m³

c) 0.55KN/m³

d) 0.44KN/m³

19. A sample of moist quartz sand was obtained by carefully pressing a sharpened hollow cylinder with a volume of 150cc. into the bottom of an excavation. The sample was trimmed flush with the ends of the cylinder and the total weight was found to be 325g. In the laboratory, the dry weight of the sand alone was found to be 240g and the weight of the empty cylinder 75g. Laboratory tests on the dry sand indicated maximum void ratio of 0.80 and minimum void ratio of 0.48. $G_s = 2.66$. Compute the density index of the sand in the field.

a) 0.43

b) 0.23

c) 0.33

d) 0.53

20. A highway embankment is to be constructed along the North Diversion road using soil from a selected borrow pit. DPWH Specifications state that the soil must be placed in layers and compacted to at least 95% of the maximum density. Also, the water should be added to the fill so that the soil is compacted at the optimum moisture content. A laboratory test to determine the maximum density and optimum moisture content has been conducted by placing a small sample of this soil into a steel cylinder and compacting it with a drop hammer. The volume of the cylinder is 0.00094cu.m. The following data has been obtained from this test.

Test No.	Wet Weight (N)	Moisture Content (%)
1	14.94	6%
2	16.36	10%
3	17.93	15%
4	18.28	23%

How many liters of water per m^3 should be added to the fill material to reach optimum moisture content and 100% maximum density if the initial moisture content of the soil is 10% (dry weight basis).

a) 102liters

b) 152liters

c) 202liters

d) 252liters

21. A soil at a constant moisture content shows the following when compacted.

Degree of Saturation	Dry Unit Weight (KN/m^3)
40%	14.50
70%	17.89

Determine the specific gravity of soil.

a) 2.64

b) 2.72

c) 2.03

d) 2.55

22. A granular soil (sand) was tested in the laboratory and was found to have a maximum and minimum void ratio of 0.84 and 0.38, respectively. The specific gravity of the soil is 2.65. If the moisture content is 9% and its moist unit weight is 18.64 kN/m^3 . Compute the relative density of the soil in the field.

a) 69.6%

b) 79.6%

c) 89.6%

d) 59.6%

23. The moist unit weight of 0.00283 m^3 of soil is 54.4N. If the moisture content is 12% and the specific gravity of soil solids is 2.72, determine the volume occupied by water in cubic meters.

a) 0.00035

b) 0.00047

c) 0.00059

d) 0.00033

24. A saturated soil having a specific gravity of 2.67 has a moisture content of 23%. Compute the moist unit weight when the degree of saturation becomes 70%.

a) 16.87 kN/m^3

b) 17.87 kN/m^3

c) 19.87 kN/m^3

d) 18.87 kN/m^3

25. A soil has a dry density of 1600 kg/m^3 and a void ratio of 0.63. Compute the specific gravity of the soil.

a) 2.61

b) 2.05

c) 2.74

d) 2.55